Studies in Learning and Teaching (SiLeT)
Homepage: https://scie-journal.com/index.php/SiLeT
Email: silet@scie-journal.com

p-ISSN: 2722-399X; e-ISSN: 2722-1857
SiLeT, Vol. 4, No. 3, December 2023
Page 634-643


# Comparison of Video-Based Learning Versus Presentations in Lectures Amongst Medical Students in Pharmacology

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**Article Info**

***Article history:***

Received May 30, 2023
Revised December 28, 2023
Accepted December 28, 2023
Available Online December 31, 2023

***Keywords:***

Medical education;
Pharmacology;
Presentation in lectures;
Video-based learning;

**ABSTRACT**

Innovative teaching methods are constantly being explored to keep students engaged and challenge them academically. This study compared the benefits of video-based learning methods compared to conventional PowerPoint presentations. A total of 150 second-year medical undergraduate students were divided into two groups. Both groups were given a pre-test to test their baseline knowledge of the topic. One group was taught the mechanisms of action of the drugs by using lectures during presentations and the other group was taught with the help of videos. A post-test was conducted, and the scores of the two groups were compared. Feedback questionnaires were also administered to understand the students' perception of the two teaching methods. The mean score in the video-based group was 15.59+2.46 and, in the presentation group, was 11.43+1.53, out of a total score of 20. A majority of 77.33% preferred video-based learning techniques. This study shows that conventional teaching techniques no longer suffice to keep students engaged and that novel approaches yield higher scores and a better learning experience. Similar studies exploring newer approaches in education are scarce. The findings of this study can be a jumping-off point for inculcating more creative teaching methods in the classroom.

https://doi.org/10.46627/silet

## INTRODUCTION

Learning is the transfer of knowledge and skills through a systematic interaction between teachers and learners. In the modern world, the influence of technology in our lives is undeniable. The subsequent decrease in the attention span has forced us to find new and creative ways to hold students' interest for prolonged periods. In a field like medical science, where every skill and information acquired starting from the first year of M.B.B.S. plays a role in patient management in the entire lifetime of a doctor, future doctors need to be trained in the best way possible.

Video-based Learning (VBL) method also gives us the benefit of teaching and approaching large numbers with uniformity and authenticity (Ramaswamy et al., 2019). VBL has unique features that make it an effective learning method. It has the potential to partly replace traditional classroom-based teacher-led learning approaches that are usually accompanied by the use of presentations currently (Merkt et al., 2011). The use of auditory and visual enhancement has already shown benefits, as educators in technologically advanced European universities started using videos in 1990 (Laurillard, 1995). In India, the first step towards the use of new tools in teaching started with presentations. The use of pictures in presentations improved students' understanding compared to the traditional method of classroom teaching. Now, with the

development that has taken place over these years, the use of videos for teaching has started in India, too. Classrooms are now connected to the internet, and interactive digital videos and video conferences have become possible.

The use of videos to display procedures, signs, and symptoms of diseases, and explanations of core concepts, even at the molecular level, is an important tool for students to increase understanding and develop a long-lasting memory. It helps students visualize the concepts. All the free-access resources that are available on various platforms can be used to provide the best explanation in a very convenient way (Colasante, 2011). Videos also attract students' attention and encourage them to engage more which can lead to better learning outcomes (Zhang et al., 2006). It has a special role to play, especially in the case of higher education where the skills and information you acquire play an important part in future work opportunities.

From a student's perspective, there has been an increased interest in studying effectively using techniques like mind maps, active recall, and the Pomodoro method compared to conventional rote learning for prolonged periods. More emphasis is placed on productive and meaningful learning that can be retained long-term. To keep up with the needs of the students, teaching techniques should evolve and become more creative.

This cognitive psychology has been adopted into Mayer's 12 principles of multimedia learning. The principles were formulated based on certain assumptions, namely the dual-channel assumption: humans have different channels to process images and speech; the limited capacity assumption: we can only process about 5-7 chunks of information at a time; and the active processing assumption: we cannot learn by passively receiving information.

**Table 1.** Mayers principles of multimedia

| Principle | |
|---|---|
| Coherence | People learn better when irrelevant information is excluded |
| Signaling | People learn better when important concepts are highlighted |
| Redundancy | Graphics and narration are better received when onscreen text is omitted |
| Spatial contiguity | Words alongside graphics are read better than words placed separately |
| Time contiguity | People learn better when corresponding narration is presented simultaneously with graphics/images |
| Segmenting | People learn better when they are in control of the pacing of the lesson and can place information into segments that are easier to process |
| Pre-training | Students benefit from a prior orientation to the lesson – with the help of key terms, handouts, supplementary materials, etc. |
| Modality | Graphics are better paired with narrations (to engage the dual channels); onscreen text with graphics might lead to visual information overload |
| Multimedia | Static Images along with words are received better than words alone |
| Personalization | People learn better when information is relayed conversationally |
| Voice | Narration is better with a human voice compared to a machine voice |
| Image | In presentations that are text and image-heavy, it is best to avoid the inclusion of the speaker's face |

(Mayer, 2017; Saeverot & Torgersen, 2016)

There has been a reported need to restructure undergraduate medical education by revising the teaching programs and methodology. While introducing new methods is always a positive step, it is also important for us to assess the impact of these new teaching methods and assess students' perceptions of them, as it will help us strengthen the methods of delivering information. Hence, this study was planned to compare the teaching methods through presentations and video-based learning on students' understanding and get insight into students' perception of these methods. Teachers can modify the techniques based on the information about students' learning styles, which will be beneficial in medical education (Vare et al., 2017).

https://doi.org/10.46627/silet.v4i3.238

**Objectives**

1. To assess the impact on learning outcomes using interactive video demonstration techniques versus presentations during lectures.
2. To assess students' perceptions regarding the use of videos compared to presentations as a learning modality.

## RESEARCH METHOD

### Study Design and Setting

This cross-sectional, observational study was conducted at D.Y. Patil deemed to be University, Navi Mumbai, India. The study protocol was approved by the Institutional Ethics Committee (DYP/IECBH/2020/44). Written informed consent was obtained from all the participants before enrolment. All the participants are second-year medical undergraduate students from the same institute.

The participants were divided into two academically validated groups: Group A and Group B. The groups were validated based on their marks in the first internal assessment. The students were arranged in ascending order of marks, and alternate students were assigned to each group.

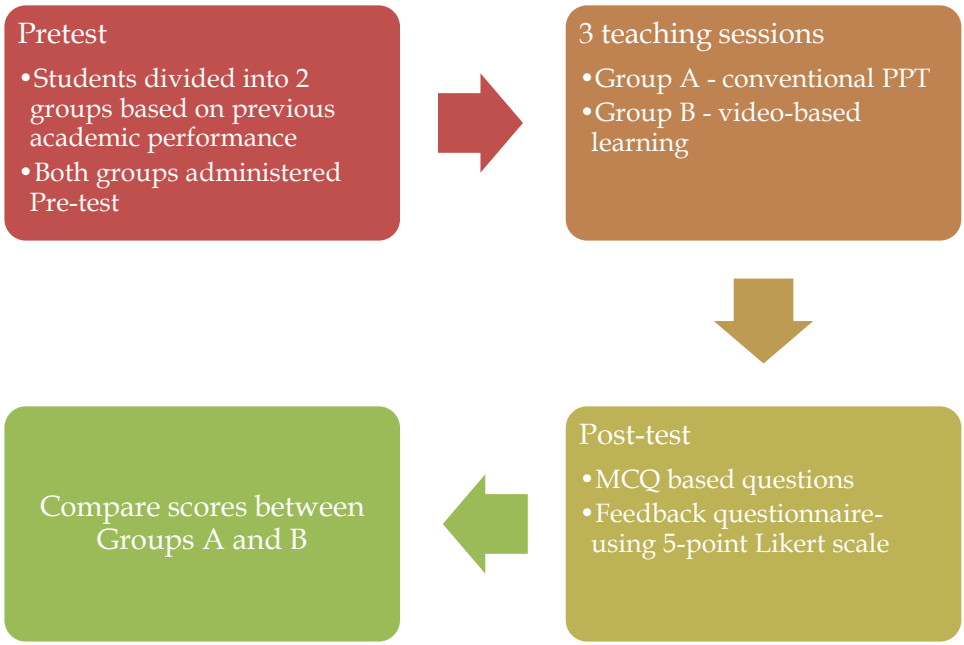


**Figure 1.** Study design

Both groups had a pre-test on the mechanisms of action of various drugs from different systems. After this, three one-hour sessions were conducted using presentations on the same topic for Group A and video-assisted learning methods for Group B. The presentation for Group A consisted of text and pictures about the topic. For group B, videos were used to make students understand the mechanism of action of drugs. A post-test was then taken after all three sessions. The tests were in the form of multiple-choice questions that were distributed through a Google form. The examination was evaluated using the answer key, which had been prepared during the question paper validation. The students were marked for each test out of a total score of 20. The marks obtained by the two groups were tabulated and analyzed statistically. Feedback was obtained with the help of a questionnaire in which all the questions had to be answered on a 5-point Likert scale. The questionnaire was pre-validated. The questions were focused on getting an insight into participants' perspective towards the teaching method they were exposed to (i.e., use of presentations during lectures or video-based learning)

### Statistical Analysis

Data entry was done using Microsoft Excel, and statistical analysis was performed using GraphPad Prism version 9.5.0. (GraphPad Software, San Diego, California USA). Continuous data were expressed as means with standard deviation (SD), and between-group comparisons were done using two independent-sample t-tests. A comparison between the pre-test and post-test values of the same group was done using a paired t-test. A 'p-value of ≤0.05 was considered statistically significant. The feedback from students was expressed in percentages.

## RESULTS AND DISCUSSION

### Results

A total of 150 students were enrolled for the study. Each group had 75 students. All the enrolled students completed the study and were included in the final analysis. The marks obtained by the students out of 20 in both groups were checked for normality, which would guide the subsequent statistical tests. The normality tests confirmed that the two groups follow the normal distribution, so we chose the parametric method for analyzing the data. Table 2 shows the participant score in both groups in the pre-and post-test.

**Table 2.** Participant score (pre- and post-test)

| Multiple choice questions score | Presentation Group (n= 75) | Video-based learning group (n= 75) |
|---|---|---|
| | Mean (SD) | Mean (SD) |
| Pre-test | 8.31 ± 2.50 | 8.93 ± 2.12 |
| Post-test | 11.43 ± 1.53 | 15.59 ± 2.46 |
| p-value | 0.03 | 0.003 |

Table 2 shows results from the paired t-test used for the above data to compare the pre-and post-test value of each group independently. Post-test scores were significantly higher than the pretest scores in both groups. Although the difference between the pre-test and post-test in the ppt group was significant (p-value is 0.03.), the difference was more statistically significant in the VBL group (p-value is 0.003.)

**Table 3.** Paired t-test: comparison of pre-test and post-test scores of PPT group.

| | |
|---|---|
| Mean Difference (pre-test minus Post-test) | -3.11 |
| Standard error of differences | 0.557 |
| 95% CI | -5.51 to -0.71 |
| t- statistic | 5.58 |
| Significance level | *P< 0.03 |

**Table 4.** Paired t-test: comparison of pre-test and post-test scores of VBL group.

| | |
|---|---|
| Mean Difference (pre-test minus Post-test) | -6.04 |
| Standard error of differences | 0.35 |
| 95% CI | -7.55 to -4.54 |
| t- statistic | 17.29 |
| Significance level | **P< 0.003 |

**Table 5.** Unpaired t-test: comparison of mean differences of scores between PPT and VBL group.

| | |
|---|---|
| Mean Difference (VBL- PPT) | 2.92 |
| Standard error of differences | 0.664 |
| 95% CI | 1.07 to 4.76 |
| t- statistic | 4.39 |
| Significance level | ** P = 0.012 |

**Table 6.** Post-test scores of the PPT and VBL group.

| | |
|---|---|
| Mean Difference (VBL minus PPT) | 4.16 |
| Standard error | 0.335 |
| 95% CI | 3.50 to 4.82 |
| t- statistic | 12.43 |
| Significance level | ***P< 0.0001 |

*P <0.05, ** P <0.01, *** P <0.001

The normality tests confirmed that the two groups follow the normal distribution, so we chose the parametric method for analyzing the data. Unpaired statistical t-tests showed the difference in mean scores between the two groups to be 4.16 (95% confidence interval: -3.50 to 4.82, $p < 0.0001$).

**Analysis of Feedback**

The feedback from the students in each group was obtained on a five-point Likert scale. For each question, students had to select an answer on a scale with five options: strongly agree, agree, neutral, disagree, and strongly disagree. A different set of questions was used for the two groups based on their relevance to the teaching method used. Figure 1 shows the feedback obtained from students who underwent video-based learning.

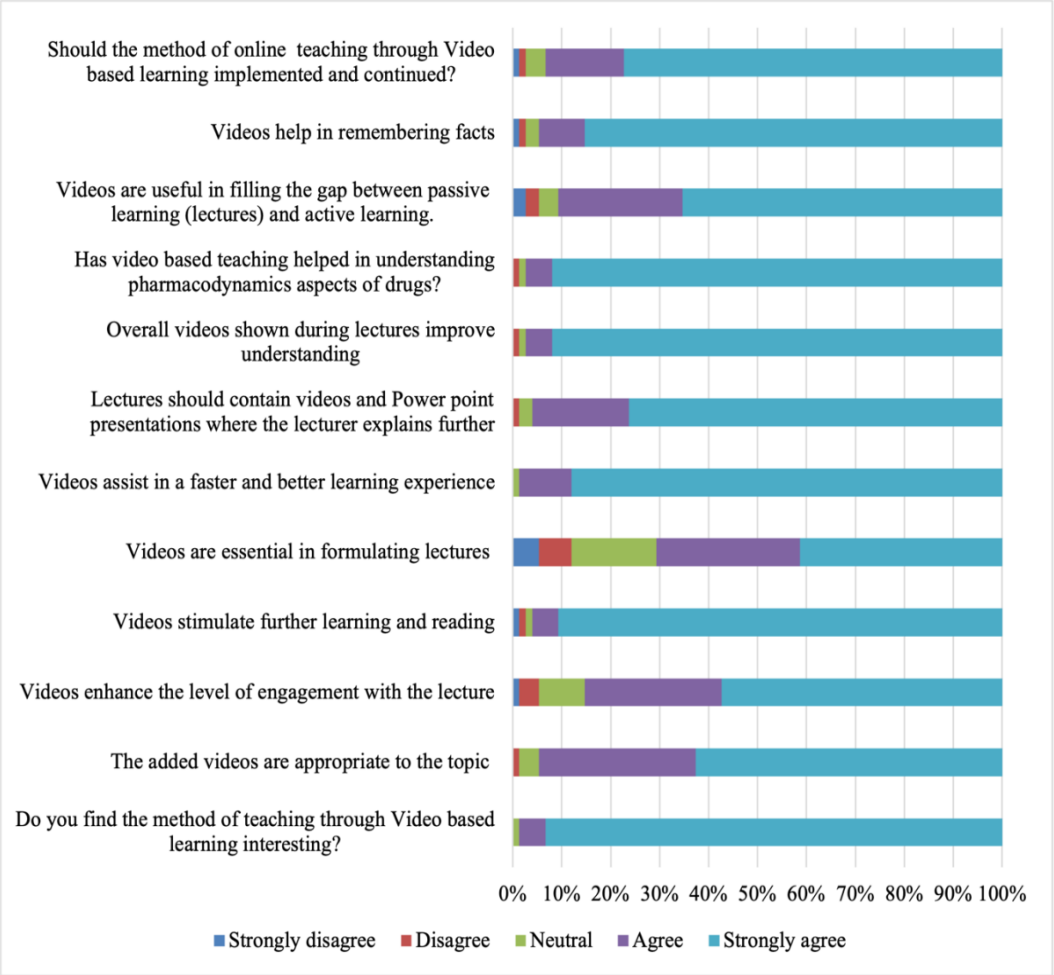


**Figure 2.** Feedback from students in the video-based learning group

https://doi.org/10.46627/silet.v4i3.238

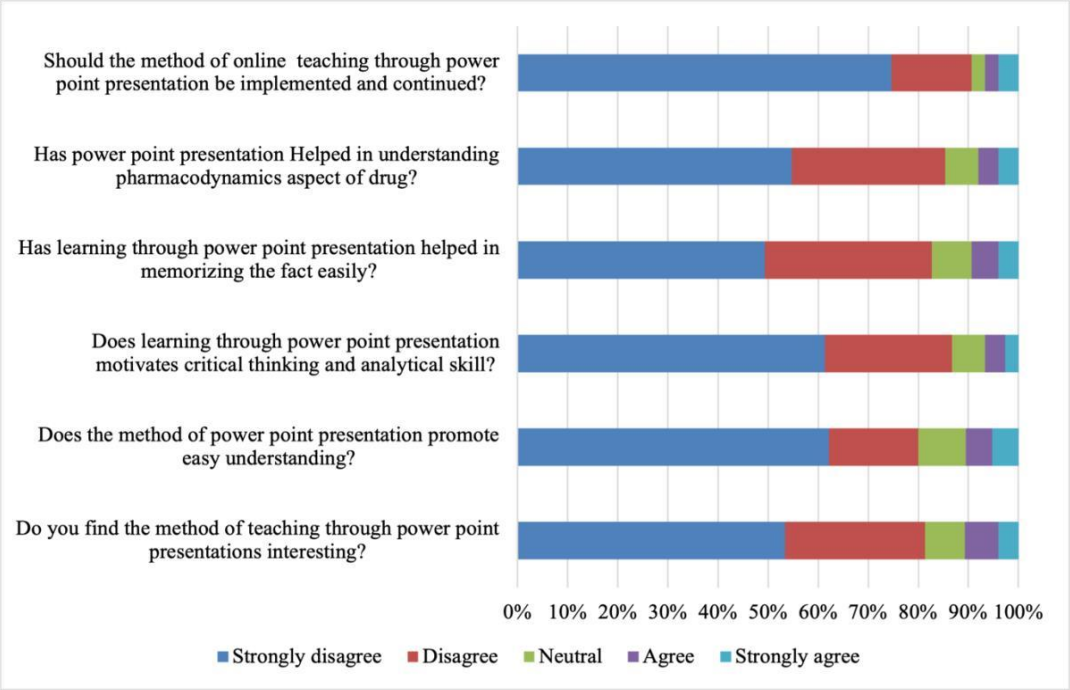


**Figure 3**. Feedback from students in the presentation group

## Discussion

Pharmacology is one of the most important subjects in the entire medical curriculum, and it is introduced to students during the second year of an undergraduate course at the same time they start getting clinical exposure through postings in the hospital. Traditionally the subject has been taught with the help of didactic lectures, practical demonstrations, and tutorials in small groups. These methods have always been teacher-centered, and learners play a passive role. The field of pharmacology is constantly growing with new drug developments taking place every day. Due to this, the students are overburdened with the content that they must learn and remember and often find it difficult to do the same.

In this study, the mean marks of the students in the post-test taught using the traditional method was 11.43 while for the visually aided method was 15.59. Students scored higher marks in the video demonstration method than in the conventional method of teaching using presentations. According to a similar study conducted in Delhi, the mean test marks were 51.35% using the traditional method and 57.23% using the visually aided method and the difference was statistically significant. The finding of this study agrees with the report of Seth (2010) that students of pharmacology in an Indian Medical College performed better when taught using computer-assisted instruction than the traditional methods (Seth, 2010). A study by Onotai et al. (2012) conducted at the University of Port-Harcourt Medical School in Nigeria found that most students preferred video-based learning and they scored better. A clear increase in academic performance among students receiving visual procedures during theoretical teaching has been observed. This might be due to multimedia tools generating a higher lasting impact on the learner as these tools have a better visual appreciation. Video-based materials have been used as a successful, cost-effective medium with the positive benefits of increased concentration and motivation during learning leading to a higher impact on understanding and retention (Choi & Johnson, 2007). Coyne et al. (2018) similarly found that video-based learning improved the knowledge and skill of students and is a preferred method due to its flexibility.

Students perceived video-based learning to be a better learning method than presentation. 93.33% of students strongly agreed that the VBL method was interesting and 53.33% of students found the presentation method to be non-interesting. 90.6% of students in the VBL group felt that a better understanding of the subject also motivated them to learn more and explore the depth of the subject. As compared to this in the presentation group, 61.33% were not motivated to read

more. VBL had a higher impact on the learner retention capacity in the acquisition of knowledge (85.33%) which matches with the findings described by Subhash et. al. (2018), while 78.66% of students in our study said that learning was not easier through the traditional method of teaching through presentations (Subhash et al., 2018). Analyzing the result from a student's point of view, it can be understood that 77.33% of students prefer VBL, which should be continued and regularly implemented. A need for change in the traditional method of teaching using presentations has been felt by 74.66% of students, which is a staggering figure, and due care about this fact needs to be taken to introduce better methods such as video-based learning.

**The Future**

While video-based learning can be an extremely useful tool in getting students more interested and engaged in the learning process, newer approaches can enhance the experience. 'Gamification' in e-learning employing reward points, leaderboards, challenges, etc., can take the mundane task of studying and give it a competitive edge. This serves to motivate students who already find studying rewarding, however. There is the possibility of an over-justification effect (decrease in the intrinsic motivation of a learner due to external incentives) (Aguiar-Castillo et al., 2020; Çakıroğlu et al., 2017; Ghai & Tandon, 2023; Gorbanev et al., 2018; Hsu & Chen, 2018; Huotari & Hamari, 2017).

Another step towards enhancing the learning experience is via Immersive virtual reality (IVR) employing technology like 3D-Head mounted display (HMD). These can provide a better simulation of real-world scenarios that are otherwise impractical for students to explore. This fully engages the visual, auditory, and tactile senses of the learner (Di Natale et al., 2020; Makransky et al., 2020; Makransky & Mayer, 2022; Makransky & Petersen, 2021; Parong & Mayer, 2021; Petersen et al., 2022).

This study is not without its limitations. It was conducted at a single medical college in a tier-1 city in India. To understand the acceptability of these new methods, we suggest widespread multicentric study in medical colleges all over the country, having representation from all strata of students and faculty.

## CONCLUSION

Video-based learning (VBL) method was found to be more effective than the use of presentations during lectures. It has positively impacted learners' understanding, motivating them to read and learn more about the subject and helping them retain the concepts for a longer period. The students prefer the use of videos frequently and wish for them to be implemented into everyday lectures. More studies can be conducted in the future where researchers can analyze the long-term impact of using video-based methods, which can then act as a guide to bring about a much-needed change in the traditional methods of teaching in medical colleges, which has been felt by the students and faculty.

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https://doi.org/10.46627/silet.v4i3.238

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